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TITLE

POWER-ON DEVICE

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a power-on device, and particularly to a power-on device that switches power supplies dynamically according to voltages of batteries to prevent charge capacities of batteries from falling too low to start immediately, circuit systems such as handsets supplied by batteries.

Description of the Related Art

Generally, most handsets, laptops and other portable electronics are primarily supplied by batteries, which meet requirements of portability. Batteries have a tendency to self-discharge. When handsets are turned off or batteries are removed from handsets, batteries return to the lowest form of energy. The amount of self-discharge differs with each system and cell design. NiCd and NiMH battery chemistries exhibit an inherently high self-discharge. Poor manufacturing practices and improper use can accelerate this phenomenon. Owing to limits of volume, batteries can have limited charge capacities. Unused after a long time, batteries have too low a charge to start handsets and display handset states, such as charge capacities, proving to be quite inconvenient.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a circuit system with a control circuit for charging. The control circuit detects charge capacities, thereby switching

power supplies accordingly. When charge capacities are too low, the circuit is supplied by an adaptor to power on and display circuit system states. When charge capacities are adequate to start, the circuit system is supplied by batteries and the adaptor charges the battery until full.

To achieve the above objects, the present invention provides a power-on device for the circuit system. The circuit system has a power supply terminal coupled to a battery and a plug inserted into an adaptor. The power-on device includes a voltage detector having an input terminal coupled to the battery. When voltage of the input terminal is below a threshold voltage, the voltage detector outputs a control signal having a first level to enable a path which the adaptor supplying the circuit system charges the battery through the plug. When voltage of the input terminal is above the threshold voltage, the voltage detector outputs the control signal having a second level to enable another path which the circuit system is supplied by the battery until charged full by the adaptor.

As well, the power-on device includes a first switch, a second switch, a third switch, a first diode, a second diode, and an inverter. An input terminal of the first switch is coupled to the plug, a control terminal of the first switch receives a first signal from the circuit system. When the control terminal of the first switch has a low level, the first switch is turned on. When the control terminal of the first switch has a high level, the first switch is turned off. The first signal is preset at high level. An anode of the first diode is coupled to an output terminal of the first switch and a cathode of the first diode is coupled to a charge input terminal of the circuit system. An input terminal of the second switch is coupled to the plug and

a control terminal of the second switch is coupled to an output terminal of the voltage detector. When the control terminal of the second switch has a low level, the second switch is turned on. When the control terminal of the second switch has a high level, the second switch is turned off. An anode of the second diode is coupled to an output terminal of the second switch and a cathode of the second diode is coupled to a charge input terminal of the circuit system. An anode of the third diode is coupled to an output terminal of the second switch and a cathode of the third diode is coupled to the battery. An input terminal of the inverter is coupled to the output terminal of the voltage detector. An input terminal of the third switch is coupled to the charge input terminal of the circuit system, a control terminal of the third switch is coupled to an output terminal of the inverter, and an output terminal of the third switch is coupled to the battery. When the control terminal of the third switch has a low level, the third switch is turned on. When the control terminal of the third switch has a high level, the third switch is turned off.

BRIEF DESCRIPTION OF THE DRAWINGS

The aforementioned objects, features and advantages of this invention will become apparent by referring to the following detailed description of the preferred embodiment with reference to the accompanying drawings, wherein:

FIG. 1 shows a block diagram of the power-on device in the present invention.

FIG. 2 shows a flowchart of the power-on device in the present invention.

DETAILED DESCRIPTION OF THE INVENTION

A power-on device provided by the present invention is illustrated by an example of a handset. It is not limited to handsets but also to other electronic devices. The power-on device has complete functions for charging, enabling the charging system to start and display handset states.

FIG. 1 shows a block diagram of the power-on device in the present invention. As shown in FIG. 1, a plug 52 of the power-on device is coupled to an adaptor. An input terminal of a first switch SW1 is coupled to the plug 52. A control terminal of the first switch SW1 receives a first signal from a circuit system 20. When the control terminal of the first switch SW1 has a low level, the first switch is turned on. When the control terminal of the first switch SW1 has a high level, the first switch is turned off. The first signal is preset at high level. An anode of the first diode D1 is coupled to an output terminal of the first switch SW1. A cathode of the first diode is coupled to a charge input terminal T1 of the circuit system. An input terminal of the second switch SW2 is coupled to the plug 52. A control terminal of the second switch SW2 is coupled to an output terminal of the voltage detector 10. An output terminal of the second switch SW2 is coupled to an anode of a second diode D2. When the control terminal of the second switch SW2 has a low level, the second switch SW2 is turned on. When the control terminal of the second switch SW2 has a high level, the second switch SW2 is turned off. An anode of the second diode D2 is coupled to an output terminal of the second switch SW2. A cathode of the second diode D2 is coupled to a charge input terminal T1 of the circuit system 20. An anode of the third diode D3 is

coupled to an output terminal of the second switch SW2. A cathode of the third diode D3 is coupled to a battery 30. An input terminal of the inverter 15 is coupled to the output terminal of the voltage detector 10. An input terminal of the third switch SW3 is coupled to the charge input terminal T1 of the circuit system 20. A control terminal of the third switch SW3 is coupled to an output terminal of the inverter 15. An output terminal of the third switch SW3 is coupled to the battery 30. When the control terminal of the third switch SW3 has a low level, the third switch SW3 is turned on. When the control terminal of the third switch SW3 has a high level, the third switch SW3 is turned off.

An input terminal of a resistor divider 50 is coupled to the battery 30. An output terminal of the resistor divider 50 is coupled to an analog-to-digital converter 22 in the circuit system 20. An output terminal of the analog-to-digital converter 22 is coupled to a display panel 24 in the circuit system 20 to display charge capacity of the battery 30.

An input terminal of the voltage detector 10 is coupled to the battery 30. When output voltage of the battery 30 is below a threshold voltage, for example 3.2V, not enough to start the circuit system 20, an output terminal of the voltage detector 10 outputs low level. Therefore, the second switch SW2 is turned on. The adaptor supplies the charge input terminal T1 of the circuit system 20 through the plug 20, the second switch SW2, and the second diode D2. Meanwhile, the adaptor charges the battery 30 through the plug 20, the second switch SW2, and the third diode D3. An input voltage of the battery 30 is converted by the resistor divider 50 and the analog-to-digital converter 22, the display panel 24 thereby showing charge capacity of the

battery 30. The first signal from the circuit system 20 is preset at high level, so the first switch SW1 is turned off. The output terminal of the voltage detector 10 has a low level, so the output terminal of the inverter 15 has a high level and the third switch SW3 is turned off.

When output voltage of the battery 30 is above a threshold voltage, for example 3.2V, enough to start the circuit system 20, an output terminal of the voltage detector 10 outputs high level. Therefore, the second switch SW2 is turned off. The output terminal of the voltage detector 10 has a high level, so the output terminal of the inverter 15 has a low level and the third switch SW3 is turned on. The battery 30 supplies the charge input terminal T1 of the circuit system 20 to maintain normal operation. The circuit system 20 turns on or turns off the first switch SW1 by the first signal to control charging of the battery 30.

FIG. 2 shows a flowchart of the power-on device in the present invention.

At step S21, the plug of the power-on device is inserted into the adaptor.

At step S22, the voltage detector detects output voltage of the battery.

At step S23, wherein, when output voltage of the battery is below a threshold voltage, the voltage detector outputs low level.

At step S24, the adaptor supplies the circuit system through the plug thereby charging the battery and starting the circuit system.

At step S25, wherein, when output voltage of the battery is above a threshold voltage, the voltage detector outputs high level.

At step S26, the circuit system is supplied by the battery.

Although the present invention has been described in its preferred embodiments, it is not intended to limit the invention to the precise embodiments disclosed herein. Those who are skilled in this technology can still make various alterations and modifications without departing from the scope and spirit of this invention. Therefore, the scope of the present invention shall be defined and protected by the following claims and their equivalents.